



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to:
2003/00434

July 25, 2003

Mr. Richard Yarde
Environmental Protection Specialist
Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208-3621

Dear Mr. Yarde:

Re: John Day Watershed Restoration Projects 2003, Upper John Day Subbasin, Grant County, Oregon

Enclosed is a biological opinion (Opinion) prepared by NOAA's National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7 of the Endangered Species Act (ESA) that addresses the John Day Watershed Restoration Projects 2003, in Grant County, Oregon. NOAA Fisheries concludes in this Opinion that the proposed action is not likely to jeopardize the continued existence of Middle Columbia River (MCR) steelhead (*Oncorhynchus mykiss*). This Opinion includes reasonable and prudent measures with terms and conditions that are necessary and appropriate to minimize the potential for incidental take associated with this project.

In addition, this document also serves as consultation on essential fish habitat (EFH) for chinook salmon (*Oncorhynchus tshawytscha*) under Public Law 104-267, the Sustainable Fisheries Act of 1996, as it amended the Magnuson-Stevens Fishery Conservation and Management Act. An EFH analysis is required for chinook salmon.

Questions regarding this Opinion should be directed to Mike Bianchi of the Oregon Habitat Branch at 541.975.1835, ext. 227

Sincerely,

Michael R. Couse

D. Robert Lohn
Regional Administrator



cc: Tim Unterwegner, ODFW
Marisa Meyer, USFWS
Larry Bright, USFS

Endangered Species Act - Section 7 Consultation Biological Opinion

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Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation

John Day Watershed Restoration Projects 2003
Upper John Day Subbasin, John Day River Basin,
Grant County, Oregon

Agency: Bonneville Power Administration

Consultation
Conducted By: NOAA's National Marine Fisheries Service,
Northwest Region

Date Issued: July 25, 2003

Issued by: *for* 

D. Robert Lohn
Regional Administrator

Refer to: 2003/00434

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1. ENDANGERED SPECIES ACT

1.1 Background

NOAA's National Marine Fisheries Service (NOAA Fisheries) received a letter on April 17, 2003, from the Bonneville Power Administration (BPA) requesting informal consultation regarding the potential effects of the John Day Watershed Restoration Projects 2003 on Middle Columbia River (MCR) steelhead (*Oncorhynchus mykiss*). The accompanying biological assessment (BA), developed by the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) described the projects and their potential effects on MCR steelhead. The BPA requested NOAA Fisheries' concurrence with a "may affect, not likely to adversely affect" (NLAA) determination for the proposed projects based upon their assertion that juveniles would not inhabit the action area during construction. Based on local knowledge and conversations with ODFW biologists, NOAA Fisheries is reasonably certain that juveniles will be present in construction areas and take is reasonably certain to occur due to the effects of the proposed activities. NOAA Fisheries responded on April 30, 2003, with a letter stating that NOAA Fisheries does not concur with the NLAA determination due to the reasonable certainty for incidental take to occur during the construction of these projects. The projects are funded by the Bonneville Power Administration.

In addition to the letter, NOAA Fisheries contacted the BPA requesting clarification of the construction specifications and an updated effects analysis to include the effects of construction activities, as well as the effects of the altered water withdrawal. The CTWSRO, already aware of the request for additional information, responded on April 29, 2003, with the requested materials. The projects are located within the Upper John Day River (UJDR) subbasin. The UJDR sub-basin is part of the John Day River (JDR) basin, a major tributary of the Columbia River.

The MCR steelhead were listed under the ESA on March 25, 1999 (64 FR 14517). MCR steelhead are known to occur in the project area. Protective regulations were issued for MCR steelhead under section 4(d) of the ESA on July 10, 2000 (65 FR 42422).

The objective of this biological opinion (Opinion) is to determine whether the projects included in the John Day Watershed Restoration Projects 2003 BA are likely to jeopardize the continued existence of MCR steelhead, and to explain why NOAA Fisheries believes the proposed action will adversely effect essential fish habitat (EFH).

1.2 Proposed Actions

The BPA, in cooperation with the CTWSRO, proposes to complete nine projects in the UJDR subbasin. The purpose of the projects is to improve fish passage and fish habitat while continuing to provide irrigation for legal water withdrawals. The CTWRSO has determined that the projects are NLAA MCR steelhead.

The projects are broken down into three types of actions: (1) Replacing gravel push-up berms with lay-flat stanchion diversion structures; (2) replacing gravel push-up berms with irrigation pump systems; and (3) installation of cool water return flow systems. The improvements in water withdrawal by removing push-up berms are intended to eliminate the need to annually enter the stream channel with heavy machinery to create the gravel push-up berms, as well as to provide improved fish passage. The cool water return systems are designed to improve the water quality in the watershed by reducing stream temperatures. All installations involving instream work will occur during the recommended in-water work window of July 15 to August 15. All disturbed riparian sites will be re-vegetated with native grasses and planted with shrubs. The project names, types, and locations of the proposed actions are found in Table 1.

Table 1. Name, Type, and Location of the Proposed John Day Watershed Restoration Projects for 2003.

Project Name	Type of Project	Project Location
Knowles Pump Station	One pump station and one pump.	West of Laycock Creek on the Mainstem John Day River between Mount Vernon and John Day.
Kruse Diversion	One pump station and one pump.	Canyon Creek South of Canyon City where the Creek Crosses Highway 395.
Allen Mullin Diversion	One pump station and two pumps.	Mainstem John Day River on the eastern edge of the town of John Day.
Mullin RFC and Crown Ranch RFC Phase II	Two return flow cooling systems.	Mainstem John Day River near the mouth of Dog Creek, east of the town of John Day.
Dixie Creek Diversions	Two lay-flat stanchion diversion structures.	Mainstem John Day River east of the mouth of Dog Creek, near the town of John Day.
Field Irrigation Reorganization	Gated pipe addition to an existing structure.	Mainstem John Day River near the mouth of Dans Creek.
Tucker Ditch Diversion	One lay-flat stanchion diversion structure.	Mainstem John Day River near the mouth of Dans Creek.
Mountain Creek Diversions	Replacing 13 annual push-up diversions with five lay-flat stanchion diversion structures.	One structure on Indian Creek, three structures on Badger Creek, and one structure on Mountain Creek, near Mitchell Oregon.

1.2.1 Permanent Lay-Flat Diversion Structures

Permanent lay-flat diversion structures are proposed to replace the annual practice of creating push-up berms in the stream channel. The new diversion structures consist of a concrete pad on the riverbed, two side walls to focus the water flow, a pipe to divert water, and an area where boards may be added to back up water behind the structure. A fishway, located away from the diversion pipe, allows for fish passage at all water levels. These diversion structures will be used to shunt portions of the stream flow for irrigation during the irrigation season (normally May 1 to October 1) and laid flat when irrigation or the diversion of water is not necessary. The diversion structure will be made by excavating into the streambed using heavy machinery and placing a concrete pad in the streambed. Stanchions will be bolted on to the concrete pad to reinforce the boards as they pond up water upstream of the structure. During construction the site will possibly need to be dewatered. If this is necessary, fish passage will be maintained around the dewatered area, and the pump will be screened in compliance with NOAA Fisheries' screening criteria. The returning water will be filtered to reduce the amount of sediment that will enter the stream.

1.2.2 Pumping Stations

The installation of the pumps and pumping stations will require adjusting the grade of the streambed. For the Allan Mullin and Knowles project, approximately 10 to 15 yards of riprap will be added to the stream substrate to form a finger jetty that will protect the pump station and promote the flushing of the fish screen hole. Silt screens and hay bales will be used to reduce the amount of sediment delivery downstream. During construction the site will possibly need to be dewatered. If dewatering is necessary, fish passage will be maintained around the dewatered area, and the pump will be screened in compliance with NOAA Fisheries screening criteria. The water bypass will be filtered to reduce the amount of sediment that will enter the stream. In addition, pipes will be installed in the riparian area to improve the efficiency of water conveyance by eliminating the loss of water via evaporation or infiltration. The irrigation diversions will be operated in a manner that is consistent with their historical use.

1.2.3 Irrigation Return Flow Cooling

These two projects will involve replacing open-ditch returns and dilapidated wooden drains with buried perforated pipes that collect irrigation water in the field and return it into the river at a much lower temperature than it would have if conveyed by ditch. The instream work involve the addition of about 12 cubic yards of riprap, placed on the streambank, to protect the outlet system.

1.2.4 Installation of a Gated Pipe

The installation of a gated pipe for irrigation will occur within the riparian area. This project will improve the efficiency of the irrigation system. There will be no instream work associated with this project. The operation of these irrigation diversions will be consistent with their historical use.

2. ENDANGERED SPECIES ACT

2.1 Biological Opinion

2.1.1 Biological Information

The MCR steelhead evolutionarily significant unit (ESU) was listed as threatened under the ESA by NOAA Fisheries on March 25, 1999 (64 FR 14517). Protective regulations for MCR steelhead were issued under section 4(d) of the ESA on July 10, 2000 (65 FR 42422). Biological information concerning the MCR steelhead is found in Busby *et al.* (1996). The major drainages in the MCR steelhead ESU are the Deschutes, John Day, Klickitat, Umatilla, Walla Walla, and Yakima river systems. NOAA Fisheries (2003) has indicated that the five-year average (geometric mean) abundance of natural MCR steelhead was up from previous years' basin estimates in the ESU. The Klickitat, Yakima, Touchet, and Umatilla systems are all well below their interim abundance targets. The John Day and Deschutes are at or above their interim targets for abundance, however, there is significant concern regarding the straying of fish into the Deschutes system from other ESUs. The productivity estimate (λ) of the MCR ESU is approximately 0.98, indicating that the productivity of MCR steelhead is slightly below its target of 1.0. NOAA Fisheries biological review team (BRT) has determined that the MCR ESU is likely to become endangered because of stock abundance and long-term productivity being depressed in the ESU (NOAA 2003).

The John Day River (JDR) is the largest river system in the range of MCR steelhead that is free of dams. No steelhead are artificially propagated in the system, and runs are driven almost exclusively by native stocks, making the JDR system unique within the ESU. However, some hatchery fish stray into the JDR system from the Columbia River (Unterwegner and Gray 1997). The ODFW estimates yearly returns of adult steelhead to the JDR basin from 3,900 to 36,400, with estimated escapement averaging 13,988 adults since 1987. NOAA Fisheries (2003) states that while the JDR system has met or exceeded interim abundance targets for the last 5 years, the long-term trend for abundance is still downward.

The JDR and its tributaries, the South Fork John Day River, Middle Fork John Day River, and Upper John Day River subbasin streams, provide spawning, rearing, and migratory habitat for both adult and juvenile life stages of MCR steelhead. In 2002, the redd abundance in these three subbasins were at their highest levels since listing. Adult MCR steelhead enter the Columbia River in the spring and migrate upriver through the summer, fall, and winter, seeking their tributary of origin. By early the following spring, the adults have reached their natal streams and spawn in gravel redds/nests from March to early June. Deposited eggs usually hatch by the July of the same year. The resulting juveniles will spend from one to four years rearing to smolt size, at which time they will begin their migration to the ocean.

Essential features of the adult spawning, juvenile rearing, and adult and migratory habitat for this species are: Substrate, water quality, water quantity, water temperature, water velocity,

cover/shelter, food (juvenile only), riparian vegetation, space, and safe passage conditions. (Bjornn and Reiser, 1991; NOAA Fisheries, 1996b; Spence *et al.*, 1996). The essential features that the proposed project may affect are: Substrate, water quality, water temperature, water velocity, cover/shelter, food, safe passage conditions and riparian vegetation.

2.1.2 Evaluating Proposed Action

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR Part 402 (the consultation regulations). In conducting analyses of habitat-altering actions under section 7 of the ESA, NOAA Fisheries uses the following steps: (1) Consider the status and biological requirements of the species; (2) evaluate the relevance of the environmental baseline in the action area to the species' current status; (3) determine the effects of the proposed or continuing action on the species; (4) consider cumulative effects; and (5) determine whether the proposed action, in light of the above factors, is likely to appreciably reduce the likelihood of species survival in the wild or adversely modify its critical habitat. In completing this step of the analysis, NOAA Fisheries determines whether the action under consultation, together with all cumulative effects when added to the environmental baseline, is likely to jeopardize the continued existence of the ESA-listed species or result in destruction, adverse modification of their critical habitat, or both. If NOAA Fisheries finds that the action is likely to jeopardize the ESA-listed species, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

Step 5 of this analysis ultimately requires that NOAA Fisheries determine whether the species-level biological requirements can be met considering the significance of the effects of the action under consultation. Recovery planning can provide the best guidance for making this determination. Recovery plans for listed salmon call for measures in each life stage that are based upon the best available scientific information concerning the listed species' biological requirements for survival and recovery. As the statutory goal of the recovery plan is for the species' conservation and survival, it necessarily must add these life-stage specific measures together to result in the survival of the species, at least, and its recovery and delisting at most. For this reason, the Recovery Plan is the best source for measures and requirements necessary in each life stage to meet the biological requirements of the species across its life cycle.

Recovery measures are feasible if they are expected to be both implemented and to result in the required biological benefit. A time period for recovery is reasonable, depending on the time requirements for implementation of the measures and the confidence in the survival of the species while the plan is implemented. The plan must demonstrate the feasibility of its measures, the reasonableness of its time requirements, and how the elements are likely to achieve the conservation and survival of the listed species based on the best science available.

NOAA Fisheries has developed guidelines for basin-level, multi-species recovery planning on which individual, species-specific recovery plans can be founded. "Basin-level" encompasses habitat, harvest, hatcheries, and hydro-power. The recovery planning analysis is contained in the document entitled "Conservation of Columbia Basin Fish: Final Basinwide Salmon Recovery

Strategy” (hereafter, the Basinwide Recovery Strategy [Federal Caucus 2000]). The Basinwide Recovery Strategy will be used to guide recovery planning for MCR steelhead. The recovery plan will provide the particular statutorily required elements of recovery goals, criteria, management actions, and time estimates that are not developed in the Basinwide Recovery Strategy.

Among other things, the Basinwide Recovery Strategy calls for restoration of degraded habitats on a priority basis to produce significant measurable benefits for listed anadromous and resident fish. Immediate and long-term priorities for restoration measures relevant to this consultation include the following general habitat improvements for tributary reaches:

- Restoring tributary flows.
- Addressing passage obstructions.
- Protecting the currently productive habitat.
- Increasing the amount of habitat.
- Improving water quality.

The Basinwide Recovery Strategy also established this specific habitat improvement action priorities for the John Day River basin:

Fix flow, screening and passage problems in priority subbasins, [including] John Day.

Until the species-specific recovery plans are developed, the Basinwide Recovery Strategy provides the best guidance for judging the significance of an individual action relative to the species-level biological requirements. In the absence of completed recovery planning, NOAA Fisheries strives to ascribe the appropriate significance to actions to the extent available information allows. Where information is not available on the recovery needs of the species, either through recovery planning or otherwise, NOAA Fisheries applies a conservative substitute that is likely to exceed what would be expected of an action if information were available.

2.1.3 Biological Requirements

The first step in the methods NOAA Fisheries uses for applying the ESA section 7(a)(2) to listed MCR steelhead is to define the species’ biological requirements that are most relevant to each consultation. NOAA Fisheries also considers the current status of the listed species taking into account population size, trends, distribution and genetic diversity. To assess the current status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list MCR steelhead for ESA protection and also considers new data available that is relevant to the determination.

The relevant biological requirements are those necessary for MCR steelhead to survive and recover to naturally reproducing population levels, at which time protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stock, enhance their capacity to adapt to various environmental conditions, and allow

them to become self-sustaining in the natural environment. For this consultation, the biological requirements are improved habitat characteristics (flow, passage, and temperature) that function to support successful adult and juvenile migration, spawning and rearing.

MCR steelhead survival in the wild depends on the proper functioning of certain ecosystem processes including habitat formation and maintenance. The restoration of improperly functioning habitat to a more properly functioning condition will likely lead to improved survival and recovery of MCR steelhead. In conducting analyses of habitat altering actions, NOAA Fisheries defines the biological requirements in terms of a concept called Properly Functioning Condition (PFC) and applies a “habitat” approach to its analysis (NMFS 1999).

2.1.4 Environmental Baseline

The current range-wide status of the identified ESU is found in NOAA Fisheries (2003). The identified action will occur within the range of MCR steelhead. The defined action area is the area that is directly and indirectly affected by the proposed action. The direct effects occur at the project site and may extend upstream or downstream based on the potential for impairing fish passage, stream hydraulics, sediment and pollutant discharge, and the extent of riparian habitat modifications. Indirect effects may occur throughout the watershed, where actions described in this Opinion lead to additional activities, or affect ecological functions, contributing to stream degradation. As such, the action area for the proposed activities include the immediate portions of the watershed containing the project and those areas 300 feet upstream of each construction area included in the proposed action, and downstream 1,500 feet below each construction area.

2.1.5 Analysis of Effects

2.1.5.1 Effects of the Proposed Action

The effects determination in this Opinion was made using a method for evaluating current aquatic conditions, the environmental baseline, and predicting effects of actions on them. This process is described in *Making Endangered Species Act determinations of effect for individual and grouped actions at the watershed scale* (NMFS 1996). The effects of actions are expressed in terms of the expected effect (restore, maintain, or degrade) on aquatic habitat factors in the action area. For the proposed actions, all conditions for the Upper John Day subbasin will be maintained or slightly improved in the long term. Therefore, the proposed action is not expected to appreciably reduce the functioning of already impaired habitats or retard the long-term progress of impaired habitats toward proper functioning condition essential to the long-term survival and recovery at the population or ESU scale. At a project scale, riparian habitat, stream temperature and fish passage should be improved as a result of these projects. NOAA Fisheries does expect some negative effects in the short-term. Specific effects are discussed below.

Impacts of the proposed actions to stream habitat and fish populations can be separated into direct and indirect effects. Direct effects are those which contribute to the immediate loss or harm to individual fish or embryos (*e.g.*, directly stepping on a fish, trampling a redd that results

in the actual destruction of embryos, or dislodging the embryos from the protective nest and ultimately destroying eggs).

Indirect effects are those impacts which occur at a later time, causing loss of specific habitat features (*e.g.*, undercut banks, sedimentation of spawning beds), localized reductions in habitat quality (*e.g.*, sedimentation, loss of riparian vegetation, changes in channel stability and structure), and ultimately cause loss or reductions of entire populations of fish, or widespread reductions in habitat quantity and/or quality.

The use of heavy equipment for the construction of the projects will cause riparian disturbance, expose bare soil, damage streambanks, and release sediment. Increased turbidity and operation of heavy equipment instream will cause fish to vacate the action area. Use of heavy equipment during construction creates the opportunity for accidental spills of fuel, lubricants, hydraulic fluid, and similar contaminants into the riparian zone or water where they can injure or kill aquatic organisms if they are present. If no water is present during construction, the activation of contaminants and sediment created from construction activities will occur when water is reintroduced to the system. These short-term increases in turbidity can result in temporary reduction in feeding efficiency for juvenile steelhead within the action areas. The activities could also result in harassment of juvenile steelhead because this work could interrupt daily activities such as sheltering and feeding. Once juvenile fish are frightened from cover and swim into open water, they become more susceptible to avian and aquatic predators.

The effects of the construction will be minimal because: (1) Construction will be conducted and completed within the July 15 to August 15 in-water work window; (2) adult spawners will not be present; (3) the instream activities for each individual action are planned to take five days or less to complete; (4) the water temperatures during the planned work periods approach the upper limit for rearing juveniles; and (5) construction activities will conform to the Natural Resource Conservation Service's (NRCS) guidelines provided in their "Field Office Technical Guides" document which describes the specific measures that will be taken to minimize or eliminate potential negative impacts to fish or fish habitat. Even with these measures to minimize negative effects, some sediment release and disturbance to the stream substrate and potential injury or harassment of juvenile steelhead that are reasonably certain to be present is likely.

The indirect effects of the new structures will be: (1) Constricted and accelerated flows, due to the abandonment of the present diversion activities that created the present stream and channel configurations; (2) the minor alteration of the present flow regime due to the ability to divert water more efficiently; (3) the alteration of the present stream morphology due to construction and implementation of the structures; and (4) improved fish passage due to the integration of fish passage structures. The proposed action will likely improve the efficiency of irrigation water management. Improvements in irrigation efficiency will lead to decreased withdrawal which is likely to improve habitat for MCR steelhead by: (1) Increasing stream flow; (2) improving fish passage; (3) expanding the season of use; (4) improving riparian conditions; and (5) decreasing stream temperatures.

The long-term, beneficial effects to MCR steelhead include the elimination of push-up berms that have radically altered and displaced stream gravels and have created fish passage problems. The inclusion of fish passage devices in the design of the structures will be beneficial, allowing adult and juvenile steelhead access to areas previously unavailable due to passage problems created by push-up berms. The annual riparian disturbance from the creation of these diversions will be eliminated. Additionally, with the reduction of annual disturbance, riparian vegetation may be able to reestablish.

While the proposed projects will have a short-term negative effect on the stream, the long-term effects should improve the present baseline conditions. The installation of diversion improvements and cool water returns flows should improve habitat in the long term by: (1) Improving fish passage; (2) reducing annual erosion and sediment contributions; (3) allowing better management of the stream flow; (4) reducing the impacts to, and improving the establishment of, riparian vegetation; (5) decreasing the annual disturbance of stream substrate; and (6) decreasing summer stream temperatures. The actions are consistent with the Basin Wide Recovery Strategy because they will: (1) Improve fish passage; (2) improve water quality by lowering stream temperatures; and (3) increase habitat by providing cool water refugia in the mainstem John Day River.

2.1.5.2 Cumulative Effects

“Cumulative effects” are defined in 50 CFR 402.02 as those effects of “future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation.” The “action area” is defined as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action” (50 CFR 402.02). The “action area” for this consultation is 1500 feet downstream and 300 feet upstream of the project areas.

The BPA has identified several activities occurring on private lands in this watershed that are reasonably certain to continue in the future. These include livestock operations and irrigation practices that include push-up berms.

Significant improvement in MCR steelhead reproductive success outside of federally-administered land is unlikely without changes in land use and land management practices occurring within these non-federal riparian areas in the JDR basin. NOAA Fisheries is not aware of any other specific future actions which are reasonably certain to occur on non-federal lands.

2.1.6 Conclusion

NOAA Fisheries has determined that, when the effects of the fish habitat restoration activities and actions associated with this project are added to the environmental baseline and the cumulative effects occurring in this area, it is not likely to jeopardize the continued existence of MCR steelhead. NOAA Fisheries believes that the proposed construction activities will cause some minor short-term increases in stream turbidity and sediment and disturbance of substrate in

the Upper John Day subbasin. Thus, the proposed action is not expected to appreciably reduce the functioning of already impaired habitats, or retard the long-term progress of impaired habitats toward proper functioning condition essential to the long-term survival and recovery at the population or ESU scale.

2.1.7 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are discretionary measures suggested to minimize or avoid adverse effects of the proposed actions on listed species, or to develop additional information. NOAA Fisheries has the following conservation recommendation regarding the action addressed in this Opinion.

1. The BPA's future restoration activities should be prioritized by their ability to improve fish passage and habitat conditions.

2.1.8 Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the agency action that may affect listed species in a manner or to an extent not considered in this Opinion; (3) the action is modified in a way that causes an effect on listed species that was not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of authorized incidental take is exceeded, any operations causing such take must cease pending conclusion of the reinitiated consultation.

2.2 Incidental Take Statement

Section 9 and rules promulgated under section 4(d) of the ESA prohibit any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, and sheltering. "Harass" is defined as actions that create the likelihood of injuring listed species by annoying it to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, feeding, and sheltering. "Incidental take" is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the impact of any incidental taking of threatened species. If necessary, it also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply to implement the reasonable and prudent measures.

2.2.1 Amount or Extent of Take

NOAA Fisheries anticipates that the proposed action is reasonably certain to result in incidental take of species listed in this Opinion. The incidental take is associated with detrimental effects from instream and near-channel construction activities which include take in the form of harm or harassment from increased short-term turbidity, sediment input, riparian disturbance or contamination from construction.

The effects of such actions are unquantifiable in the short term, and are not expected to be measurable as long-term harm to habitat features or by long-term harm to salmonid behavior or population levels. Therefore, even though NOAA Fisheries expects some low level incidental take to occur due to the proposed action covered by this Opinion, the best scientific and commercial data available are not sufficient to enable NOAA Fisheries to estimate the specific amount of incidental take to the species itself. In instances such as these, NOAA Fisheries designates the expected level of take as “unquantifiable”. Based on the information in the BA, NOAA Fisheries anticipates that an unquantifiable amount of incidental take could occur as a result of the habitat altering actions covered by the Opinion. The extent of the take includes the aquatic and associated riparian habitats affected by the projects extending upstream 300 feet and downstream 1,500 feet of each project site.

2.2.2 Effect of the Take

In this Opinion, NOAA Fisheries has determined that the level of anticipated take is not likely to result in jeopardy to MCR steelhead when the reasonable and prudent measures are implemented.

2.2.3 Reasonable and Prudent Measures

NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to minimize the likelihood of take of MCR steelhead resulting from the actions covered by this Opinion. The BPA shall:

1. Minimize the likelihood of incidental take by avoiding or minimizing damage to riparian and aquatic habitats.
2. Minimize the likelihood of incidental take by avoiding or minimizing pollution.
3. Minimize the likelihood of incidental take by ensuring that water withdrawals do not increase.

4. Complete a comprehensive monitoring and reporting program to ensure implementation of requirements found in this Opinion.

2.2.4 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the BPA must comply with the following terms and conditions, which will implement the reasonable and prudent measures described above. These terms and conditions should be incorporated into construction contracts and subcontracts to ensure that the work is carried out in the manner prescribed. Implementation of the terms and conditions within this Opinion will further reduce the risk of impacts to MCR steelhead and their habitat in the action area. These terms and conditions are non-discretionary.

1. To implement reasonable and prudent measure #1 (heavy equipment use), the BPA shall ensure that:
 - a. Minimum area. Construction effects will be confined to the minimum area necessary to complete the project.
 - b. In-water work. All work within the active channel that could contribute sediment or toxicants downstream will be completed within the ODFW approved in-water work period (July 15 - August 15). Work will be completed from the bank whenever possible to minimize disturbance of the stream bottom.
 - c. Work period extensions. Extensions of the in-water work period, including those for work outside the wetted perimeter of the stream but below the ordinary high water mark, must be approved in writing by NOAA Fisheries.
 - d. Water Pumping. Water pumped from the work isolation area will be discharged into an upland area providing over ground flow before returning to the creek. Discharge will occur so that it does not cause erosion. Discharges into potential fish spawning areas or areas with submerged vegetation are prohibited.
 - e. Fish passage. Work will not inhibit passage of any adult or juvenile salmonid species throughout the construction period or after project completion. Channel modifications which could adversely affect fish passage are not authorized by this Opinion.
 - f. Temporary access roads. Existing roadways or travel paths will be used whenever possible. Temporary access roads are designed as follows:
 - i. No stream crossings will occur at known or suspected spawning areas or within 300 feet upstream or 100 feet downstream of such areas where impacts to spawning areas may occur.
 - ii. Where stream crossings are essential, the crossing design will accommodate reasonably foreseeable risks (*e.g.*, flooding and associated bedload and debris) to prevent diversion of streamflow out of the channel and down the road in the event of crossing failure.
 - iii. Vehicles and machinery must cross riparian areas and streams at right angles to the main channel wherever possible.
 - iv. The number of stream crossings shall be minimized.

- v. Once the project is completed any side channel road ruts that may hold water and entrain fish will be smoothed out.
- g. Cessation of work. All project operations, except efforts to minimize storm or high flow erosion, will cease under high flow conditions that may result in inundation of the project area.
- h. Pre-construction activities. Before significant alteration of the action area, the following actions will be accomplished.
 - i. Boundaries of the clearing limits associated with site access and construction are flagged to prevent ground disturbance of critical riparian vegetation, wetlands and other sensitive sites beyond the flagged boundary.
 - ii. The following erosion control materials are onsite:
 - (1) A supply of erosion control materials (*e.g.*, silt fence and straw bales) is on hand to respond to sediment emergencies. Sterile straw or hay bales will be used when available to prevent introduction of weeds.
 - (2) An oil-absorbing, floating boom is available on-site during all phases of construction whenever surface water is present.
 - iii. All temporary erosion controls (*e.g.*, straw bales, silt fences) are in place and appropriately installed downslope of project activities within the riparian area. Effective erosion control measures will be in place at all times during the contract, and will remain and be maintained until permanent erosion control measures are effective.
- i. Heavy Equipment. Heavy equipment use will be restricted as follows.
 - i. When heavy equipment is required, the equipment having the least impact will be used (*e.g.*, minimally-sized, rubber-tired).
 - ii. Excavators will have properly guarded belly pan for pioneering type of work in rough terrain.
 - iii. Heavy equipment will be fueled, maintained and stored as follows:
 - (1) All equipment that is used for instream work will be cleaned before conducting operations below the bankfull elevation. External oil and grease will be removed, along with dirt and mud. No untreated wash and rinse water will be discharged into streams and rivers without adequate treatment.
 - (2) Vehicle staging, maintenance, refueling, and fuel storage areas will be located outside (a minimum of 150 feet where feasible) of riparian areas.
 - (3) All vehicles operated within riparian areas of any stream or water body will be inspected daily for fluid leaks before leaving the vehicle staging area. Any leaks detected will be repaired before the vehicle resumes operation.
 - (4) When not in use, vehicles will be stored in the vehicle staging area, a minimum of 150 feet (where feasible) from any water course.

- j. Site preparation. Site preparation is completed in the following manner, including removal of stream materials, topsoil, surface vegetation and major root systems.
 - i. Any instream large wood or riparian vegetation moved or altered during construction will stay on the site or be replaced with a functional equivalent.
 - ii. Tree removal will be mitigated for onsite by a 2:1 replanting ratio.
 - iii. Whenever the project area is to be revegetated or restored, native channel material, topsoil and native vegetation removed for the project should be stockpiled for redistribution on the project area.
- k. Earthwork. Earthwork, including drilling, excavation, dredging, filling and compacting, is completed in the following manner:
 - i. Boulders, rock, woody materials and other natural construction materials used for the project must be obtained from outside the 100-year floodplain.
 - ii. Material removed during excavation will only be placed where it cannot enter streams or other waterbodies.
 - iii. All exposed or disturbed areas will be stabilized to prevent erosion.
 - (1) Areas of bare soil within 150 feet of waterways, wetlands or other sensitive areas will be stabilized by native seeding,¹ mulching, and placement of erosion control blankets and mats, if applicable, quickly as reasonable after exposure, but within seven days of exposure.
 - (2) Seeding outside the growing season will not be considered adequate nor permanent stabilization.
 - iv. All erosion control devices will be inspected before, during, and after construction to ensure that they are working adequately, and erosion control devices will be inspected periodically to ensure proper function.
 - v. If inspection shows that the erosion controls are ineffective, work crews will be mobilized immediately, during working and off-hours, to make repairs, install replacements, or install additional controls as necessary.
 - vi. Erosion control measures will be judged ineffective when turbidity plumes are evident in waters occupied by listed salmonids during any part of the year.
 - vii. If soil erosion and sediment resulting from construction activities are not effectively controlled, the engineer will limit the amount of disturbed area to that which can be adequately controlled.
 - viii. Sediment will be removed from sediment controls once it has reached 1/3 of the exposed height of the control. Whenever straw bales are used, they will be staked and dug into the ground 5 inches (12 cm). Catch basins will

¹ By Executive Order 13112 (February 3, 1999), Federal agencies are not authorized to permit, fund or carry out actions that are likely to cause, or promote, the introduction or spread of invasive species. Therefore, only native vegetation that is indigenous to the project vicinity, or the region of the state where the project is located, shall be used.

be maintained so that no more than 6 inches (15 cm) of sediment depth accumulates within traps or sumps.

- ix. Sediment-laden water created by construction activity will be filtered before it leaves the right-of-way or enters a stream or other waterbody. Silt fences or other detention methods will be installed as close as reasonable to culvert outlets to reduce the sediment entering aquatic systems.

l. Site restoration. Site restoration and cleanup, including protection of bare earth by seeding, planting, mulching and fertilizing, is done in the following manner.

- i. All damaged areas will be restored to pre-work conditions including restoration of original streambank lines, and contours.
- ii. All exposed soil surfaces, including construction access roads and associated staging areas, will be stabilized at finished grade with mulch, native herbaceous seeding, and native woody vegetation before October 1. On cut slopes steeper than 1:2, a tackified seed mulch will be used so that the seed does not wash away before germination and rooting occurs. In steep locations, a hydro-mulch will be applied at 1.5 times the normal rate.
- iii. Disturbed areas will be planted with native vegetation specific to the project vicinity or the region of the state where the project occurs, and will comprise a diverse assemblage of woody and herbaceous species.
- iv. Plantings will be arranged randomly within the revegetation area.
- v. All plantings will be completed before June 1 of the following spring.
- vi. No herbicide application will occur within 100-year floodplain as part of this permitted action. Mechanical removal of undesired vegetation and root nodes is permitted.
- vii. No surface application of fertilizer will be used within 50 feet of any stream channel as part of this permitted action.
- viii. Plantings in areas disturbed by construction activities will achieve an 80% survival success after three years.
 - (1) If success standard has not been achieved after three years, the BPA will submit an alternative plan to the NOAA Fisheries. The alternative plan will address temporal loss of function.
 - (2) Plant establishment monitoring will continue and plans will be submitted to the BPA until site restoration success has been achieved.

2. To implement reasonable and prudent measure #2 (pollution control), the BPA shall ensure that:

- a. Pollution and Erosion Control Plan. A pollution and erosion control plan (PECP) will be developed for each authorized project to prevent point-source pollution related to construction operations. The PECP will contain the pertinent elements listed below and meet requirements of all applicable laws and regulations.

- i. Methods that will be used to prevent erosion and sedimentation associated with access roads, stream crossings, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations and staging areas.
 - ii. Methods that will be used to confine and remove and dispose of excess concrete, cement and other mortars or bonding agents, including measures for washout facilities.
 - iii. A description of the hazardous products or materials that will be used, including inventory, storage, handling, and monitoring.
 - iv. A spill containment and control plan with notification procedures, specific clean up and disposal instructions for different products, quick response containment and clean up measures that will be available on site, proposed methods for disposal of spilled materials, and employee training for spill containment.
 - v. Measures that will be taken to prevent construction debris from falling into any aquatic habitat. Any material that falls into a stream during construction operations will be removed in a manner that has a minimum impact on the streambed and water quality.
 - vi. Treated wood materials will not be used in the construction of or as a part of an instream structure.²
3. To implement reasonable and prudent measure #3 (water withdrawal), the BPA shall ensure that the project is designed to minimize or avoid impacts to natural resources by ensuring that:
- a. No increase in the rate, volume, or timing of water diversions will occur.
 - b. Diversion structures shall be screened to meet NOAA Fisheries criteria.³
4. To implement reasonable and prudent measure #4 (monitoring and reporting), the BPA shall submit a report by March 1 of the following year to NOAA Fisheries describing the previous years activities related to this project. This report will consist of the following information:
- a. Project identification.
 - i. Project name;
 - ii. project location by 5th field hydrological unit code (HUC) and lat long;

² "Treated wood" means lumber, pilings, and other wood products preserved with alkaline copper quaternary (ACQ), ammoniacal copper arsenate (ACA), ammoniacal copper zinc arsenate (ACZA), copper naphthenate, chromated copper arsenate (CCA), pentachlorophenol, or creosote

³ National Marine Fisheries Service, *Juvenile Fish Screen Criteria* (revised February 16, 1995) and *Addendum: Juvenile Fish Screen Criteria for Pump Intakes* (May 9, 1996) (guidelines and criteria for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens) (<http://www.nwr.noaa.gov/1hydroweb/ferc.com>).

- iii. starting and ending dates for work completed; and
 - iv. the BPA contact person.
- b. Isolation of in-water work area. All projects involving isolation of in-water work areas must include a report with the following information:
 - i. The name and contact information of the fish biologist in charge of the project;
 - ii. methods used to isolate the work area and minimize disturbances to ESA-listed species; and
 - iii. stream conditions before and following placement and removal of barriers.
- c. Pollution and erosion control. A summary of all pollution and erosion control inspection reports, including descriptions of any failures experienced with erosion control measures, efforts made to correct them and a description of any accidental spills of hazardous materials.
- d. Site restoration. Summary of the following conditions:
 - i. Log and rock structure repair;
 - ii. planting composition and density;
 - iii. a summary of planting and seeding efforts; and
 - iv. a narrative assessment of the project's effects on natural stream function.
- e. The annual report will be submitted to:

Oregon State Director - Portland
 National Marine Fisheries Service
Attn: 2003/00434
 525 NE Oregon Street, Suite 500
 Portland, OR 97232

- f. NOTICE. If a dead, injured, or sick endangered or threatened species specimen is found, initial notification must be made promptly to the National Marine Fisheries Service Law Enforcement Office, at Vancouver Field Office, 600 Maritime, Suite 130, Vancouver, Washington 98661; phone: 360.418.4246. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. Besides the care of sick or injured endangered and threatened species, or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence with the specimen is not unnecessarily disturbed.

3. MAGNUSON-STEVENSON ACT

3.1 Background

The objective of the EFH consultation is to determine whether the proposed action may adversely affect designated EFH for relevant species, and to recommend conservation measures

to avoid, minimize, or otherwise offset potential adverse effects to EFH resulting from the proposed action.

3.2 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NOAA Fisheries on activities that may adversely affect EFH.

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting the definition of EFH: “Waters” include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle (50 CFR 600.110).

Section 305(b) of the MSA [6 USC 1855(b)] requires that:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH;
- NOAA Fisheries shall provide conservation recommendations for any Federal or State Activity that may adversely affect EFH;
- Federal agencies shall within 30 days after receiving conservation recommendations from NOAA Fisheries provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations.
- The response shall include a description of measures proposed by the agency for avoiding, mitigating or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA Fisheries, the Federal agency shall explain its reason for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

3.3 Identification of EFH

The Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Pacific salmon: Chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (*i.e.*, natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the *Pacific Coast Salmon Plan* (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based on this information. The John Day River and its tributaries are designated EFH for chinook salmon.

3.4 Proposed Action

The proposed action is detailed above in section 1.2 of the ESA portion of this Opinion. The action area includes the restoration projects, and adjacent stream and riparian areas. This area has been designated as EFH for various life stages of chinook salmon.

3.5 Effects of Proposed Action

As described in detail in the ESA portion of this consultation, the proposed activities may result in detrimental, short-term, adverse effects to a variety of habitat parameters.

3.6 Conclusion

NOAA Fisheries believes that the proposed action will adversely affect the EFH for chinook salmon.

3.7 EFH Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations for any Federal or state agency action that would adversely affect EFH. In addition to conservation measures proposed for the project by the BPA and GSWCD, all of the reasonable and prudent measures and terms and conditions contained in sections 2.2.3 and 2.2.4, respectively, of the ESA portion of this Opinion are applicable to salmon EFH. Therefore, NOAA Fisheries incorporates each of those measures here as EFH conservation recommendations.

3.8 Statutory Response Requirement

Please note that the MSA (section 305(b)) and 50 CFR 600.920(j) requires the BPA to provide a written response to NOAA Fisheries' EFH conservation recommendations within 30 days of its

receipt of this letter. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. If the response is inconsistent with NOAA Fisheries' conservation recommendations, the BPA shall explain its reasons for not following the recommendations.

3.9 Supplemental Consultation

The BPA must reinitiate EFH consultation with NOAA Fisheries if the action is substantially revised or new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920).

4. LITERATURE CITED

Section 7(a)(2) of the ESA requires biological opinions to be based on "the best scientific and commercial data available." This section identifies the data used in developing this Opinion.

Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. American Fisheries Society Special Publication 19:83-138.

Busby, P.T., T. Wainwright, G.J. Bryant, L.J. Leirheimer, R.S. Waples, and I.V. Lagomasino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California.

Chilcote, Mark. Conservation Status of Steelhead in Oregon. 1998. Oregon Department of Fish and Wildlife Information Report No. 98-3, Portland, Oregon.

Meehan, W.R. ed. 1991. Influences of Forest and Rangeland Management of Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19, Bethesda, Maryland.

NMFS (National Marine Fisheries Service). 1996. Making Endangered Species Act determinations of effect for individual and grouped actions at the watershed scale. National Marine Fisheries Service, Habitat Conservation Program, Portland, Oregon.

NMFS (National Marine Fisheries Service). 1997. Status Review Update for Deferred and Candidate ESUs of West Coast Steelhead. December. (Available @ www.nwr.noaa.gov under Protected Resources Division, Status Reviews).

NMFS (National Marine Fisheries Service). 1999. The Habitat Approach: Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids. Guidance memorandum from Assistant Regional Administrators for Habitat Conservation and Protected Resources to staff. 3 pages. August. NMFS, 525 NE Oregon Street, Suite 500, Portland, Oregon 97232-2737. (Available @ www.nwr.noaa.gov, under Habitat Conservation Division, Habitat Guidance Documents).

NOAA (National Oceanographic and Atmospheric Administration). 2003. Co-manager review draft: Preliminary conclusions regarding the updated status of listed ESU's of West Coast salmon and steelhead. NOAA Fisheries, Seattle, WA.142pp. (<http://www.nwfsc.noaa.gov/>).

ODEQ (Oregon Department of Environmental Quality). 1999. DEQ's 1998 303d List of Water Quality Limited Streams & Oregon's Criteria Used for Listing Waterbodies. Oregon Department of Environmental Quality (DEQ), Portland, OR. (www.deq.state.or.us/wq/303dlist/303d.page.htm).

PFMC (Pacific Fisheries Management Council). 1999 Amendment 14 to the Pacific Coast Salmon Plan, Appendix A: Description and Identification of Essential Fish Habitat, Adverse Impacts and Recommended Conservation Measures for Salmon. Portland, Oregon.

Spence, B. C., G. A. Lomnický, R. M. Hughes, and R. P. Novitzki. 1996. An ecosystem approach to salmonid conservation. ManTech Environmental Research Services, Inc., Corvallis, Oregon, to National Marine Fisheries Service, Habitat Conservation Division, Portland, Oregon (Project TR-4501-96-6057).

Unterwegner, T.J. and M.E. Gray. 1997. Annual Report, John Day Fish District, Northeast Region, 1997. Unpublished Report. Oregon Department of Fish and Wildlife. John Day, Oregon.